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Tanaka

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(54) **PRINTING APPARATUS AND CONTROLLING METHOD**

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(51) **Int. Cl.**

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G03G 15/00	(2006.01)
G03G 21/00	(2006.01)
G03G 13/16	(2006.01)
G03G 15/16	(2006.01)

(52) **U.S. Cl.**

CPC ***G03G 13/16*** (2013.01); ***G03G 15/1695*** (2013.01); *G03G 15/6558* (2013.01)

(58) **Field of Classification Search**

CPC G03G 2215/00531; G03G 2215/00708; G03G 15/1695; G03G 15/657; B65H 2301/5115; B41M 5/0011
USPC 399/390, 322; 400/120.18
See application file for complete search history.

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(57) **ABSTRACT**

If the elapsed time since a sheet was stored in a sheet storage unit is less than or equal to a threshold value, control is performed such that the sheet is heated by a fixing unit before an image is transferred to the sheet, and if the elapsed time since the sheet was stored in the sheet storage unit exceeds the threshold value, control is performed such that processing for heating the sheet with the fixing unit before the image is transferred to the sheet is not performed.

8 Claims, 16 Drawing Sheets

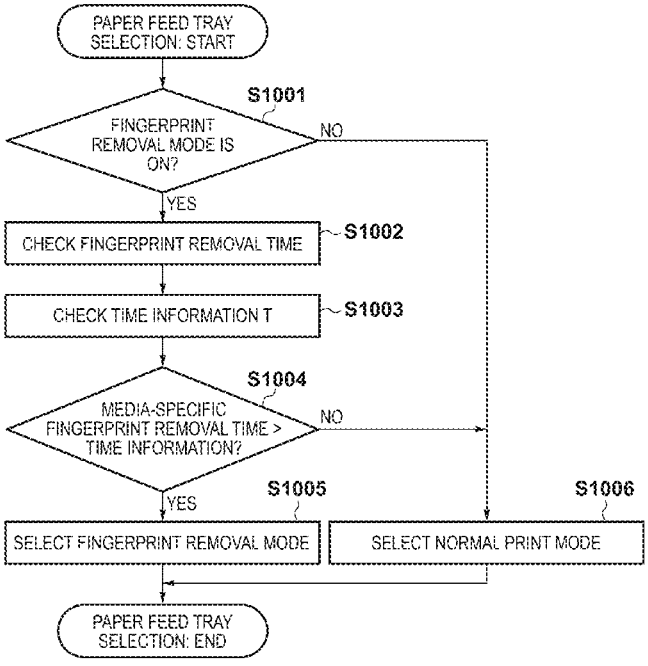


FIG. 1

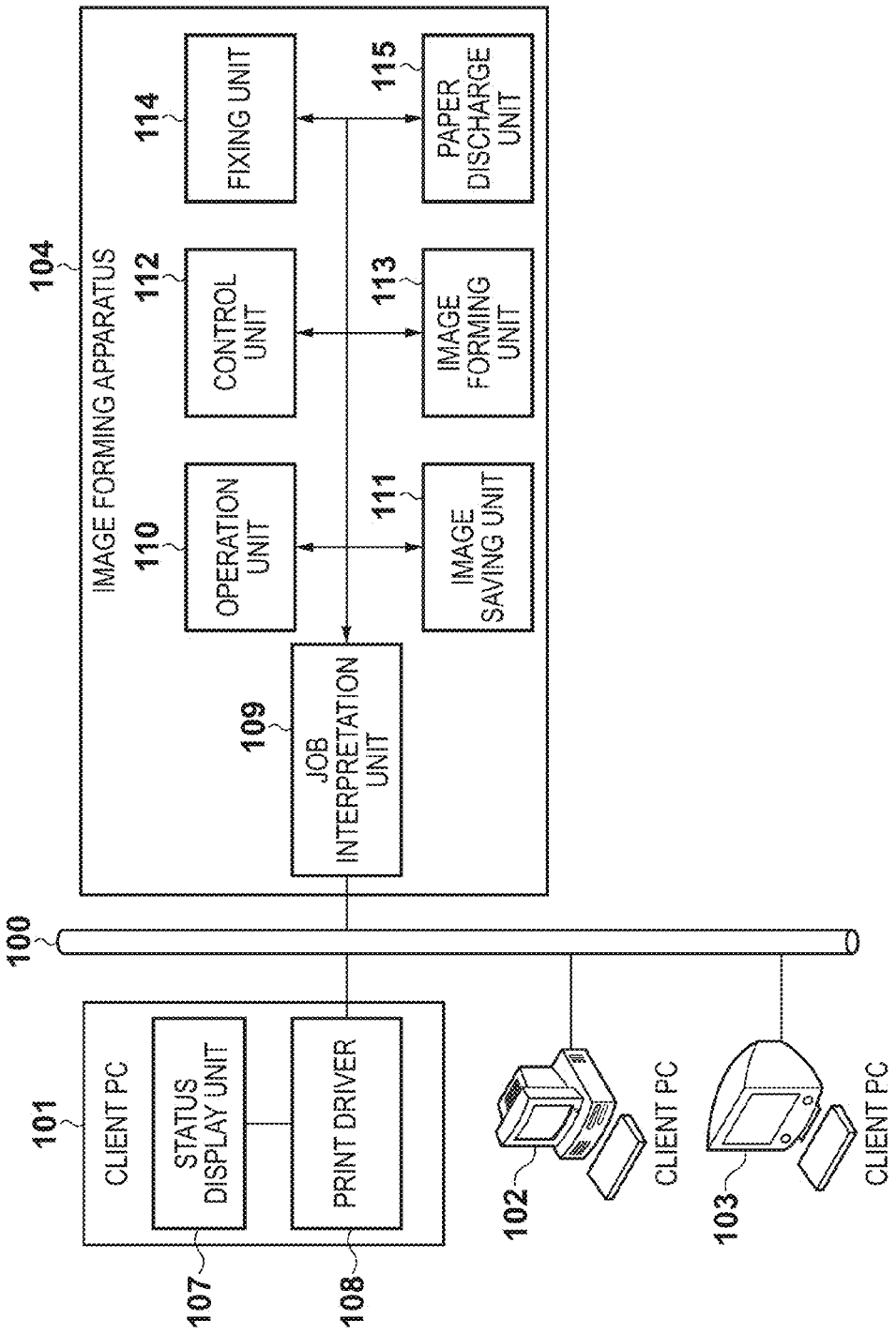


IMAGE FORMING APPARATUS
104
FIXING UNIT
114
PAPER DISCHARGE UNIT
115
CONTROL UNIT
112
IMAGE FORMING UNIT
113
OPERATION UNIT
110
IMAGE SAVING UNIT
111
JOB INTERPRETATION UNIT
109
100
CLIENT PC
101
STATUS DISPLAY UNIT
PRINT DRIVER
107
108
102
CLIENT PC
103
CLIENT PC

FIG. 2

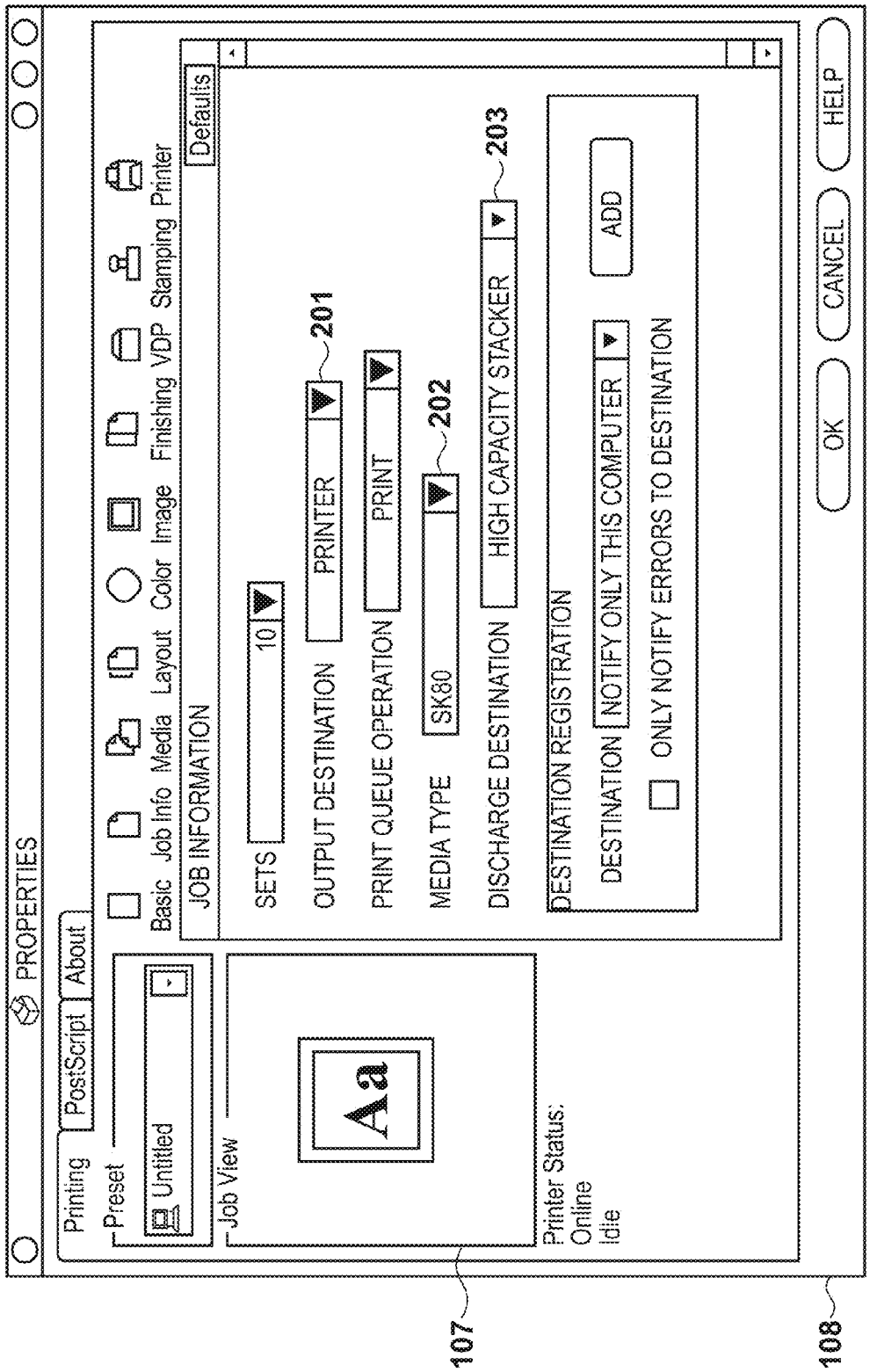

PROPERTIES
Printing
PostScript
About
Preset
Untitled
Job View
Aa
Printer Status:
Online
Idle
Basic
Job Info
Media
Layout
Color
Image
Finishing
VDP
Stamping
Printer
Defaults
JOB INFORMATION
SETS
10
OUTPUT DESTINATION
PRINTER
201
PRINT QUEUE OPERATION
PRINT
MEDIA TYPE
SK80
202
DISCHARGE DESTINATION
HIGH CAPACITY STACKER
203
DESTINATION REGISTRATION
DESTINATION
NOTIFY ONLY THIS COMPUTER
ADD
ONLY NOTIFY ERRORS TO DESTINATION
OK
CANCEL
HELP
107
108

FIG. 3

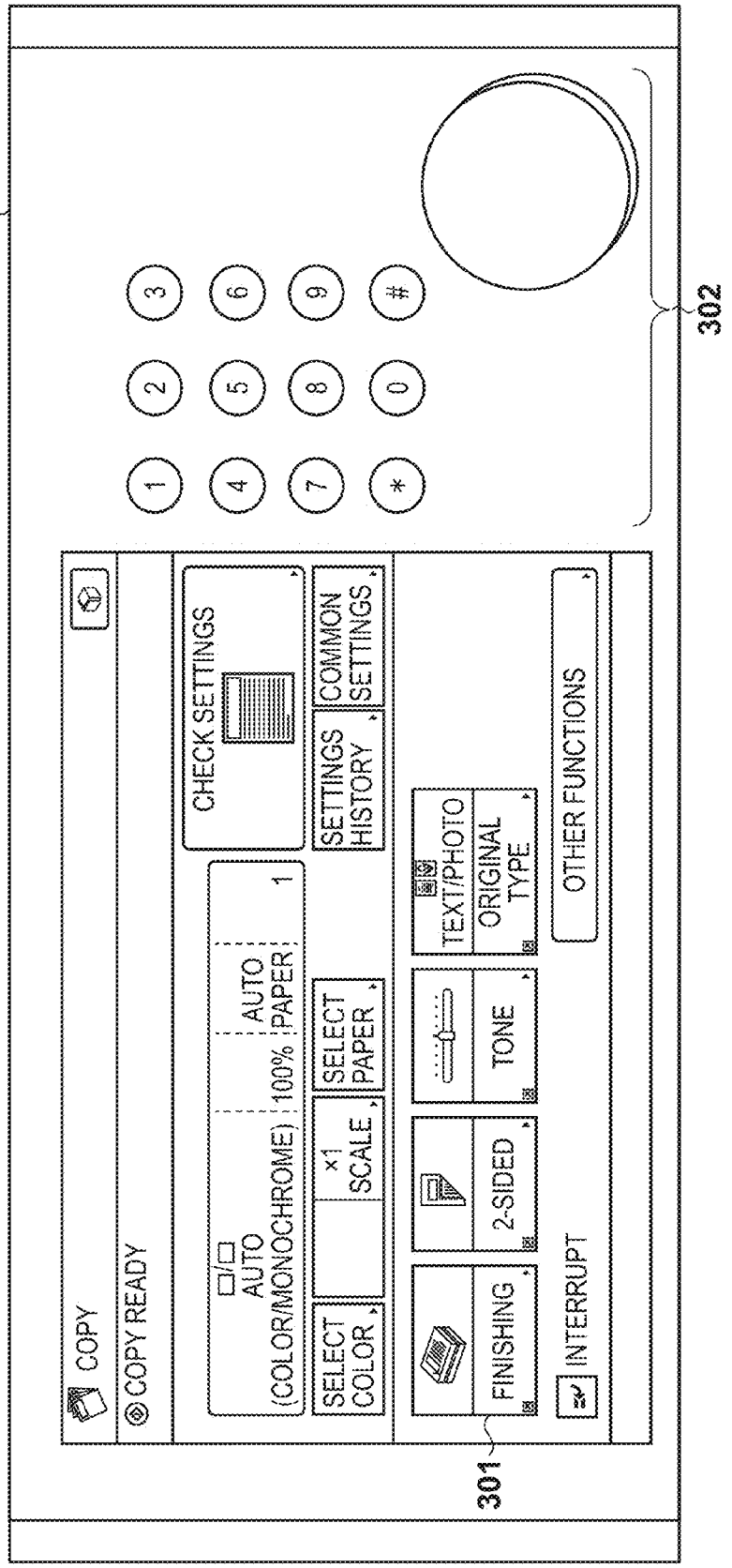

300
COPY
COPY READY
AUTO
(COLOR/MONOCHROME)
100%
AUTO PAPER
1
CHECK SETTINGS
SELECT COLOR
×1
SCALE
SELECT PAPER
SETTINGS HISTORY
COMMON SETTINGS
FINISHING
2-SIDED
TONE
TEXT/PHOTO
ORIGINAL TYPE
INTERRUPT
OTHER FUNCTIONS
1
2
3
4
5
6
7
8
9
*
0
#
301
302

FIG. 4

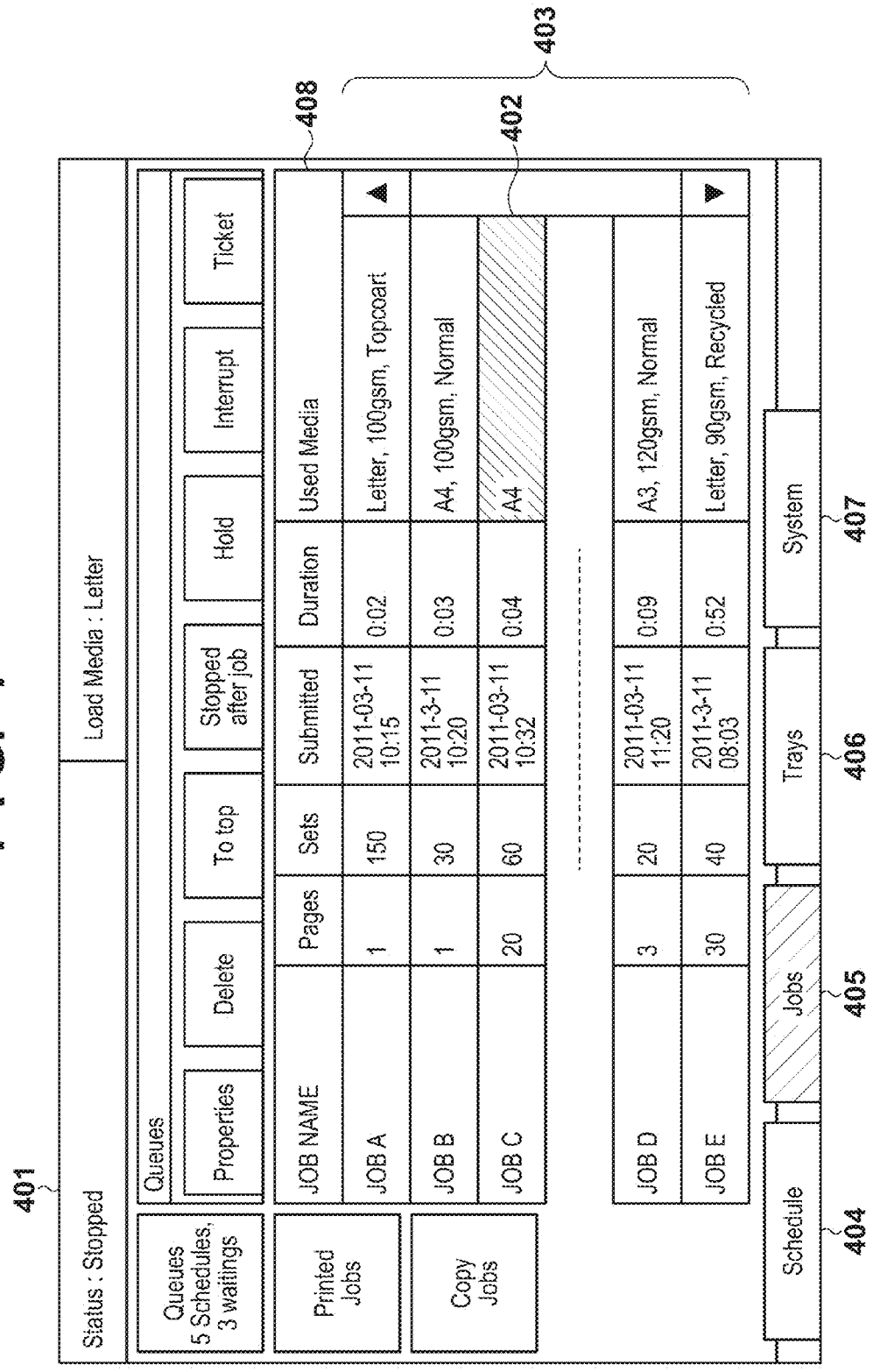

401
Status : Stopped
Load Media : Letter
Queues
5 Schedules, 3 waitings
Properties
Delete
To top
Stopped after job
Hold
Interrupt
Ticket
Printed Jobs
Copy Jobs
JOB NAME
Pages
Sets
Submitted
Duration
Used Media
408
403
402
JOB A
1
150
2011-03-11 10:15
0:02
Letter, 100gsm, Topcoart
JOB B
1
30
2011-3-11 10:20
0:03
A4, 100gsm, Normal
JOB C
20
60
2011-03-11 10:32
0:04
A4
JOB D
3
20
2011-03-11 11:20
0:09
A3, 120gsm, Normal
JOB E
30
40
2011-3-11 08:03
0:52
Letter, 90gsm, Recycled
Schedule
Jobs
Trays
System
404
405
406
407

FIG. 5

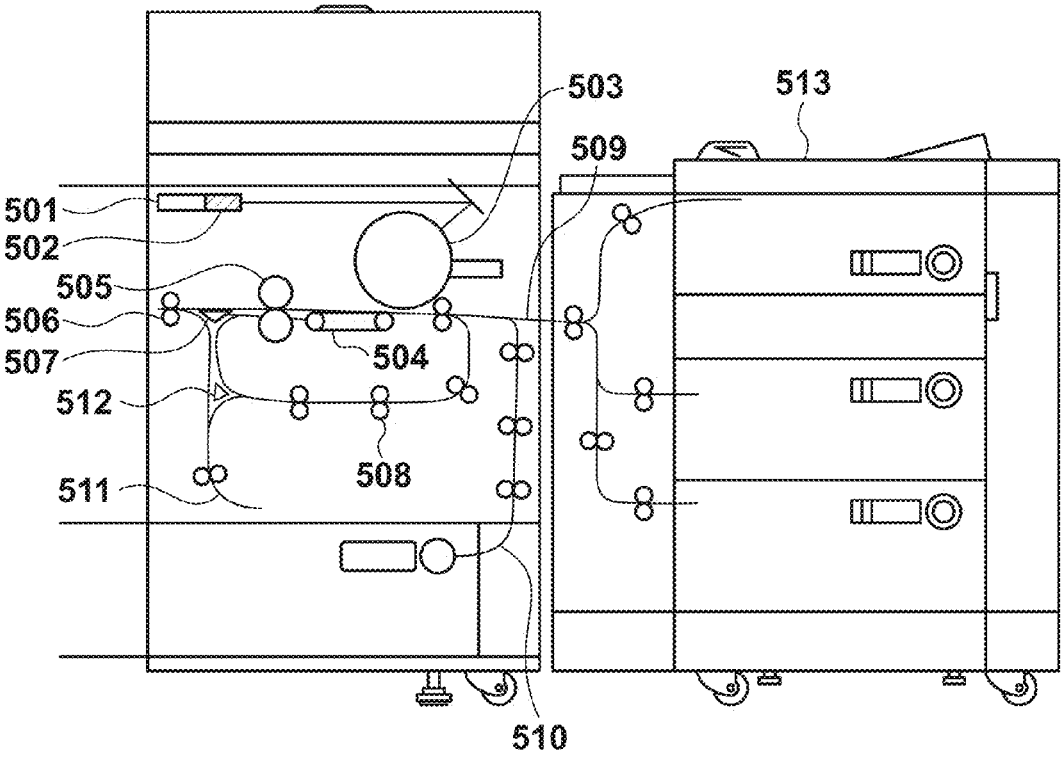


FIG. 6

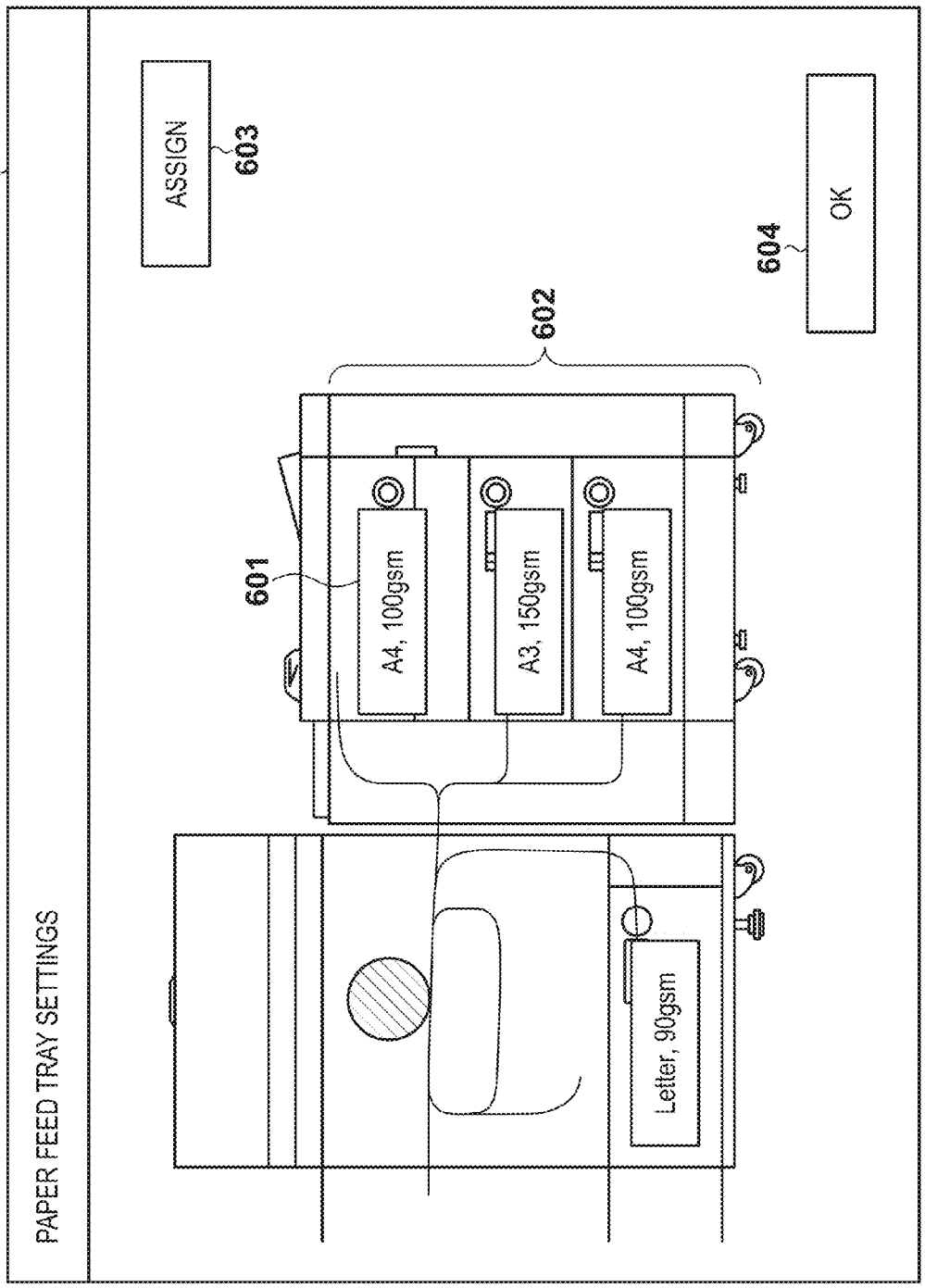

600
PAPER FEED TRAY SETTINGS
ASSIGN
603
OK
604
602
601
A4, 100gsm
A3, 150gsm
A4, 100gsm
Letter, 90gsm

FIG. 7

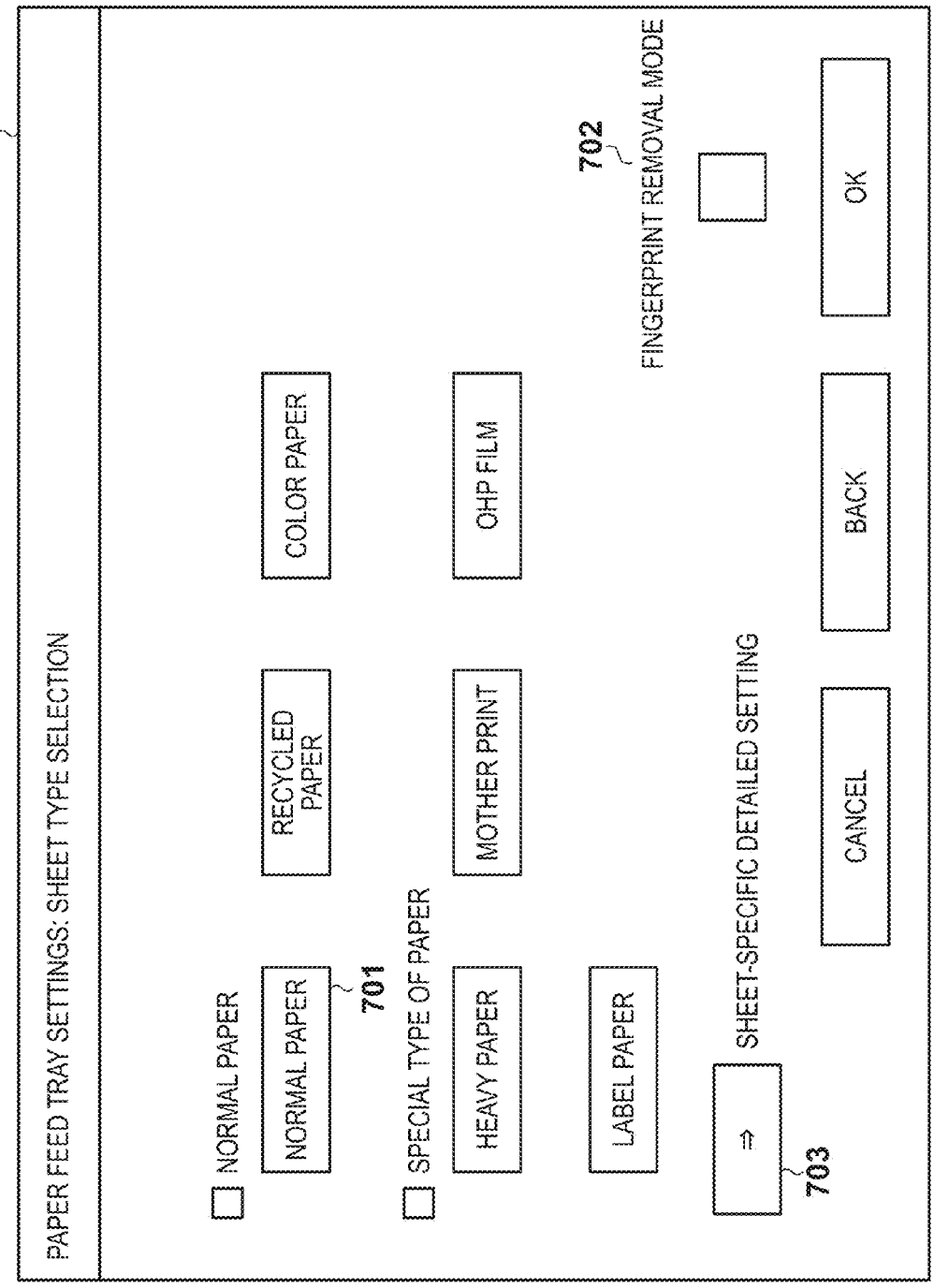

700
PAPER FEED TRAY SETTINGS: SHEET TYPE SELECTION
NORMAL PAPER
NORMAL PAPER
RECYCLED PAPER
COLOR PAPER
701
SPECIAL TYPE OF PAPER
HEAVY PAPER
MOTHER PRINT
OHP FILM
LABEL PAPER
702
FINGERPRINT REMOVAL MODE
⇒
SHEET-SPECIFIC DETAILED SETTING
703
CANCEL
BACK
OK

FIG. 8

800

CASSETTE NAME (805)	MODEL (805)	PAPER FEED TRAY OPEN (806)	FINGERPRINT REMOVAL MODE (801)	SHEET TYPE (801)	REMAINING SHEET AMOUNT (802)	ADDED SHEET AMOUNT (803)	ELAPSED TIME (804)
MANUAL PAPER FEED	MANUAL	Open	ON	NORMAL PAPER 1		ON	1 MIN (13:24)
BUILT-IN CASSETTE 1	INVERSION CASSETTE	Close	ON	NORMAL PAPER 2	100%	10%	5 MIN (13:20)
BUILT-IN CASSETTE 2	INVERSION CASSETTE	Close	ON	RECYCLED PAPER	60%	-	3 DAYS
POD DECK 1	MANUAL	Close	ON	COATED PAPER	10%	-	4 DAYS
POD DECK 2	MANUAL	Close	OFF	COLOR PAPER	20%	-	OVER 1 WEEK
POD DECK 3	MANUAL	Close	ON	NORMAL PAPER 1	90%	-	OVER 1 WEEK
:	:	:		:	:	:	:

FIG. 9

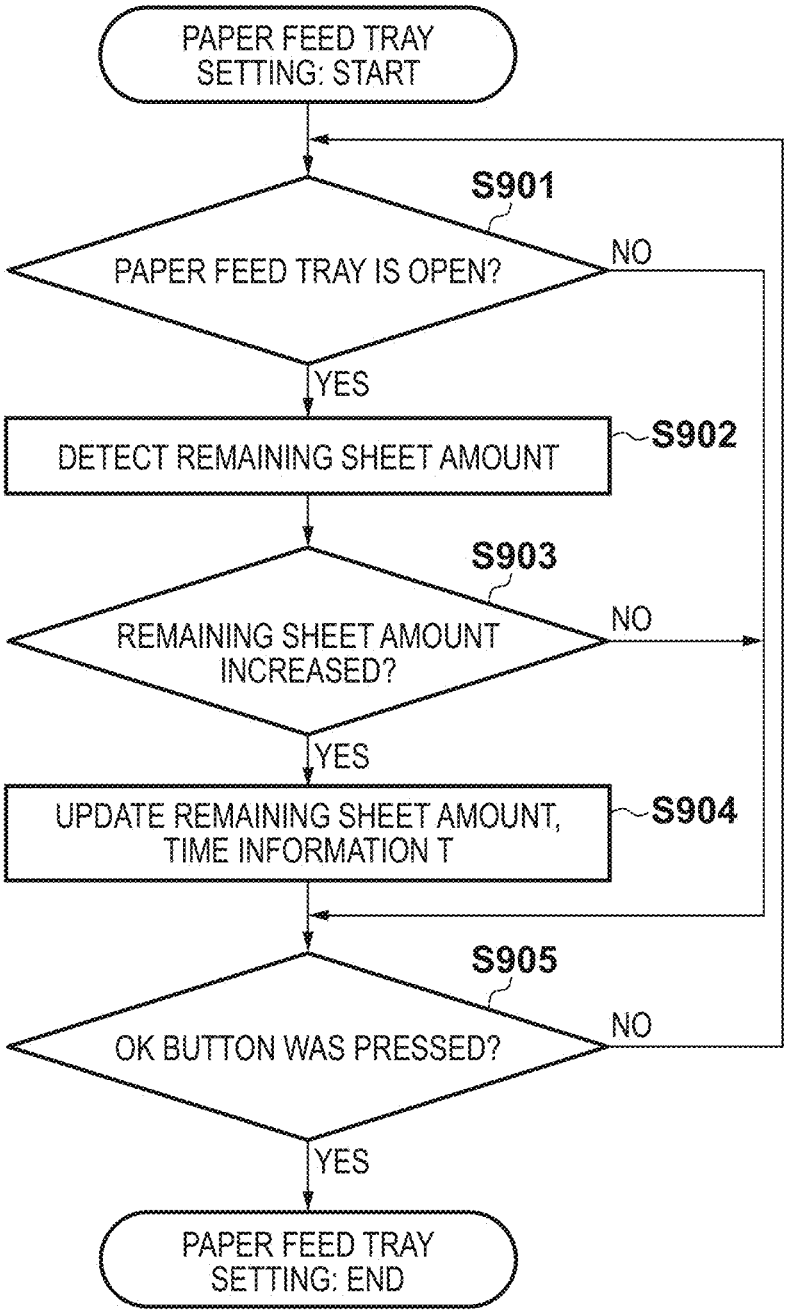

PAPER FEED TRAY SETTING: START
S901
PAPER FEED TRAY IS OPEN?
NO
YES
DETECT REMAINING SHEET AMOUNT
S902
S903
REMAINING SHEET AMOUNT INCREASED?
NO
YES
UPDATE REMAINING SHEET AMOUNT, TIME INFORMATION T
S904
S905
OK BUTTON WAS PRESSED?
NO
YES
PAPER FEED TRAY SETTING: END

FIG. 10

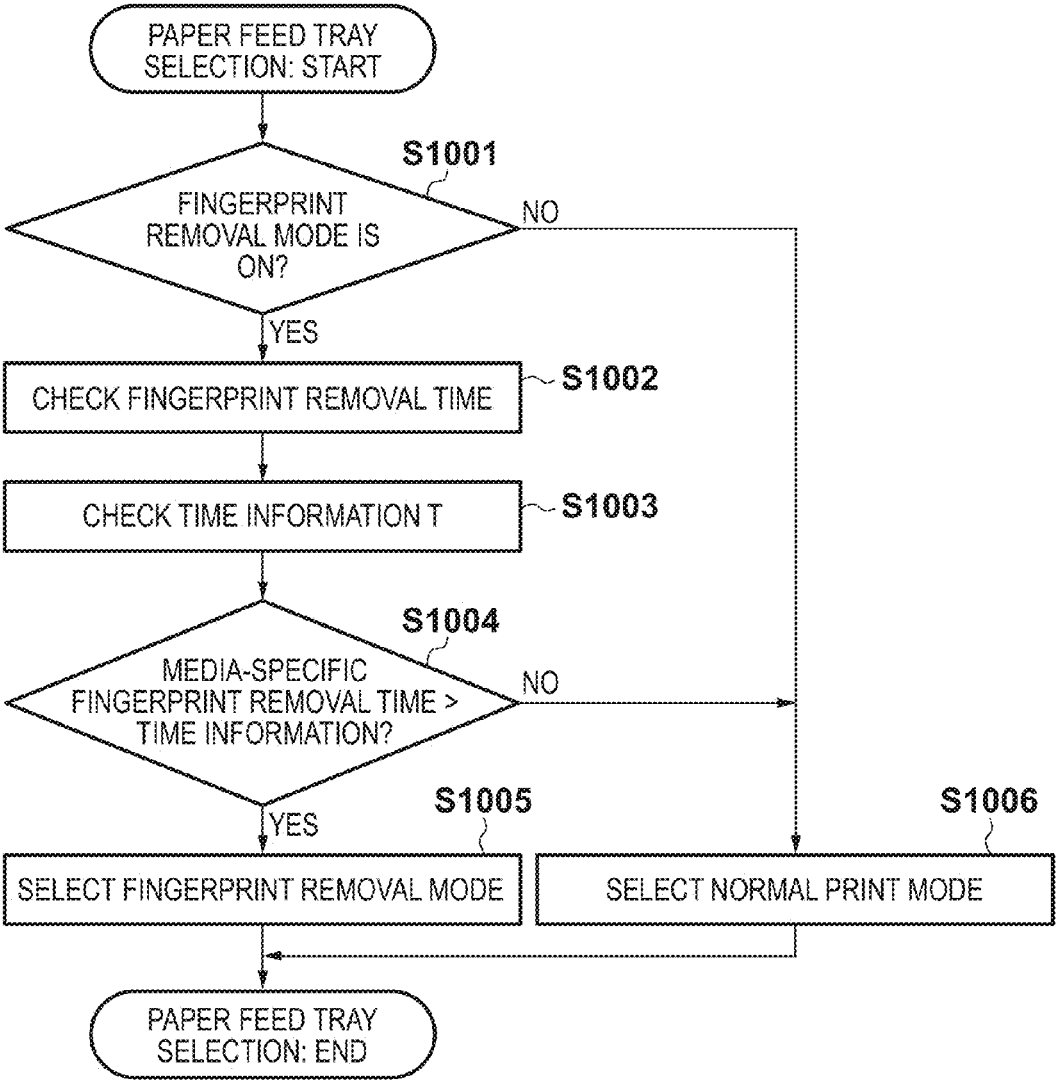

PAPER FEED TRAY SELECTION: START
S1001
FINGERPRINT REMOVAL MODE IS ON?
NO
YES
CHECK FINGERPRINT REMOVAL TIME
S1002
CHECK TIME INFORMATION T
S1003
S1004
MEDIA-SPECIFIC FINGERPRINT REMOVAL TIME > TIME INFORMATION?
NO
YES
S1005
S1006
SELECT FINGERPRINT REMOVAL MODE
SELECT NORMAL PRINT MODE
PAPER FEED TRAY SELECTION: END

FIG. 11

1100

NAME	TYPE (1101)	FINGERPRINT REMOVAL TIME A (MIN) (1102)
SK80	NORMAL PAPER	30
SK105	NORMAL PAPER	40
SK157	NORMAL PAPER	20
SK209	NORMAL PAPER	15
GLOSSY COATED PAPER A4	COATED PAPER	15
HEAVY COATED PAPER 142 gsm	COATED PAPER	10
. .	. .	. .

FIG. 12

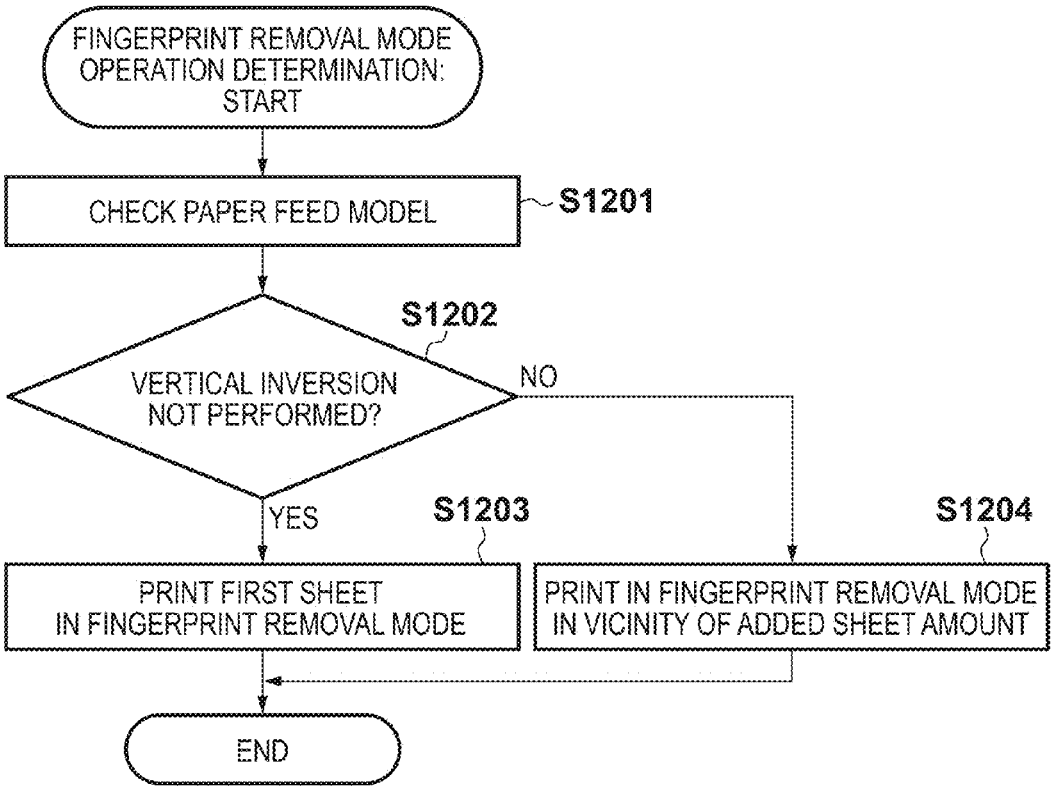

FINGERPRINT REMOVAL MODE OPERATION DETERMINATION: START
CHECK PAPER FEED MODEL
S1201
S1202
VERTICAL INVERSION NOT PERFORMED?
NO
YES
S1203
S1204
PRINT FIRST SHEET IN FINGERPRINT REMOVAL MODE
PRINT IN FINGERPRINT REMOVAL MODE IN VICINITY OF ADDED SHEET AMOUNT
END

FIG. 13

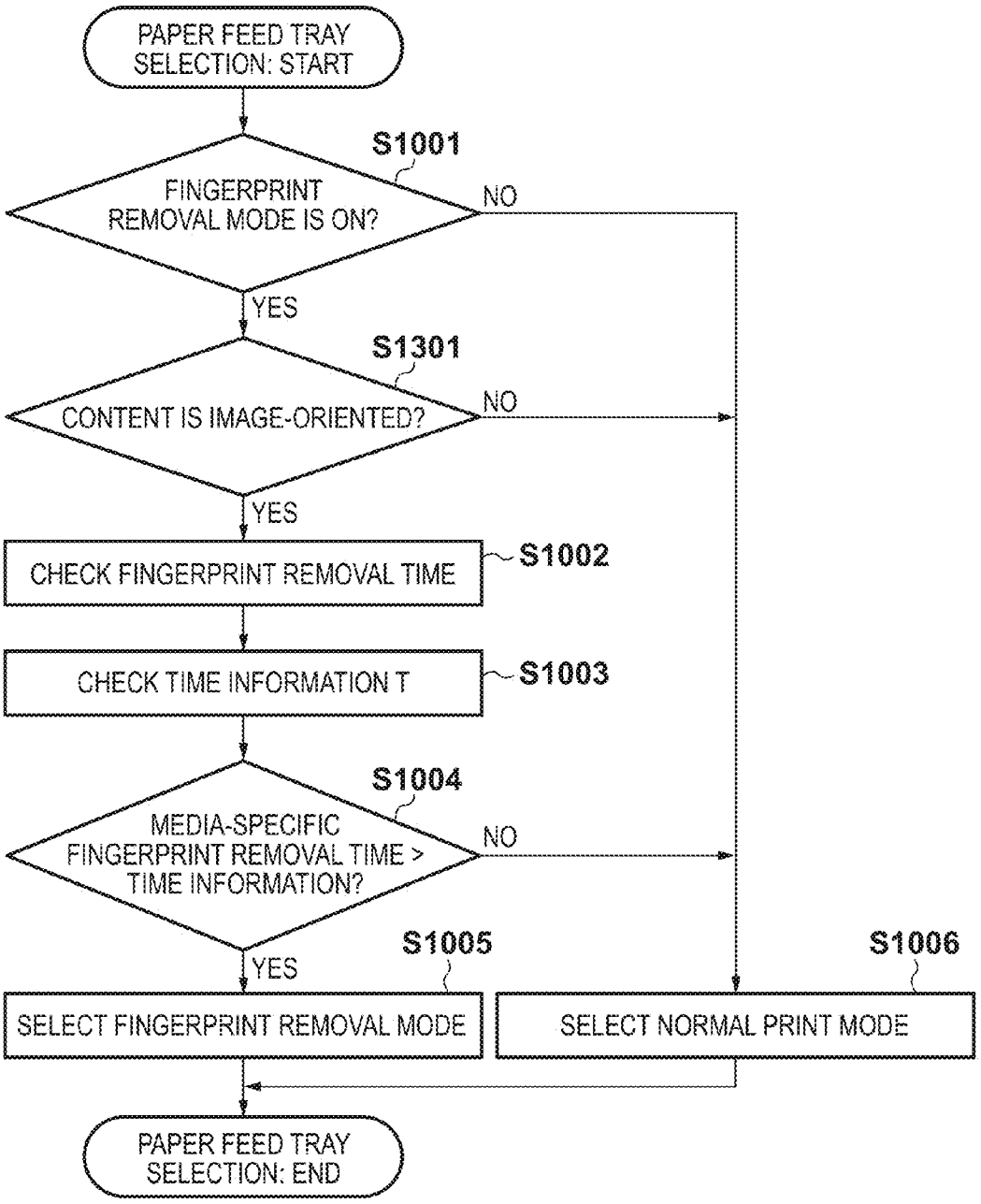

PAPER FEED TRAY SELECTION: START
S1001
FINGERPRINT REMOVAL MODE IS ON?
NO
YES
S1301
CONTENT IS IMAGE-ORIENTED?
NO
YES
CHECK FINGERPRINT REMOVAL TIME
S1002
CHECK TIME INFORMATION T
S1003
S1004
MEDIA-SPECIFIC FINGERPRINT REMOVAL TIME > TIME INFORMATION?
NO
YES
S1005
S1006
SELECT FINGERPRINT REMOVAL MODE
SELECT NORMAL PRINT MODE
PAPER FEED TRAY SELECTION: END

FIG. 14

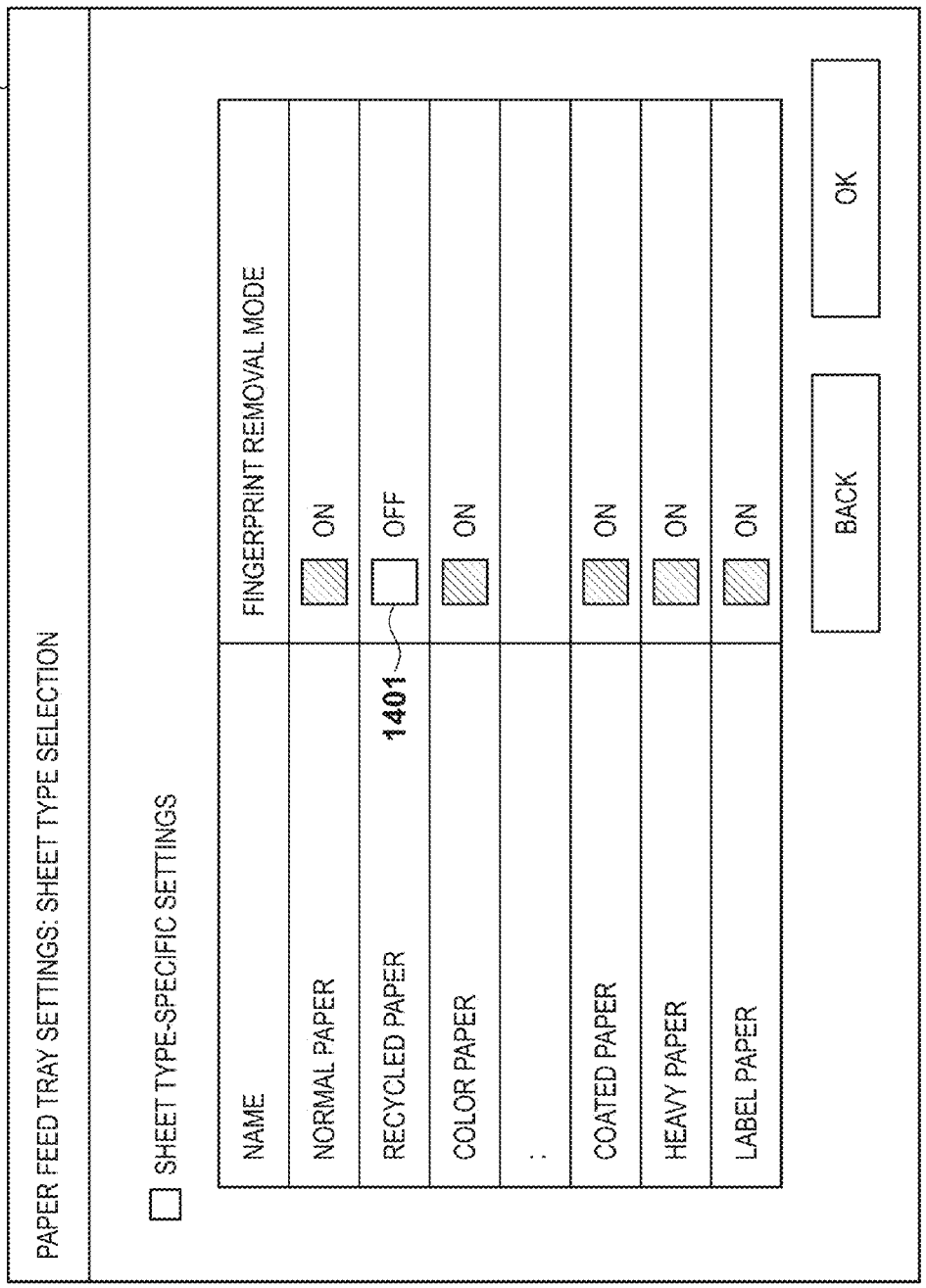
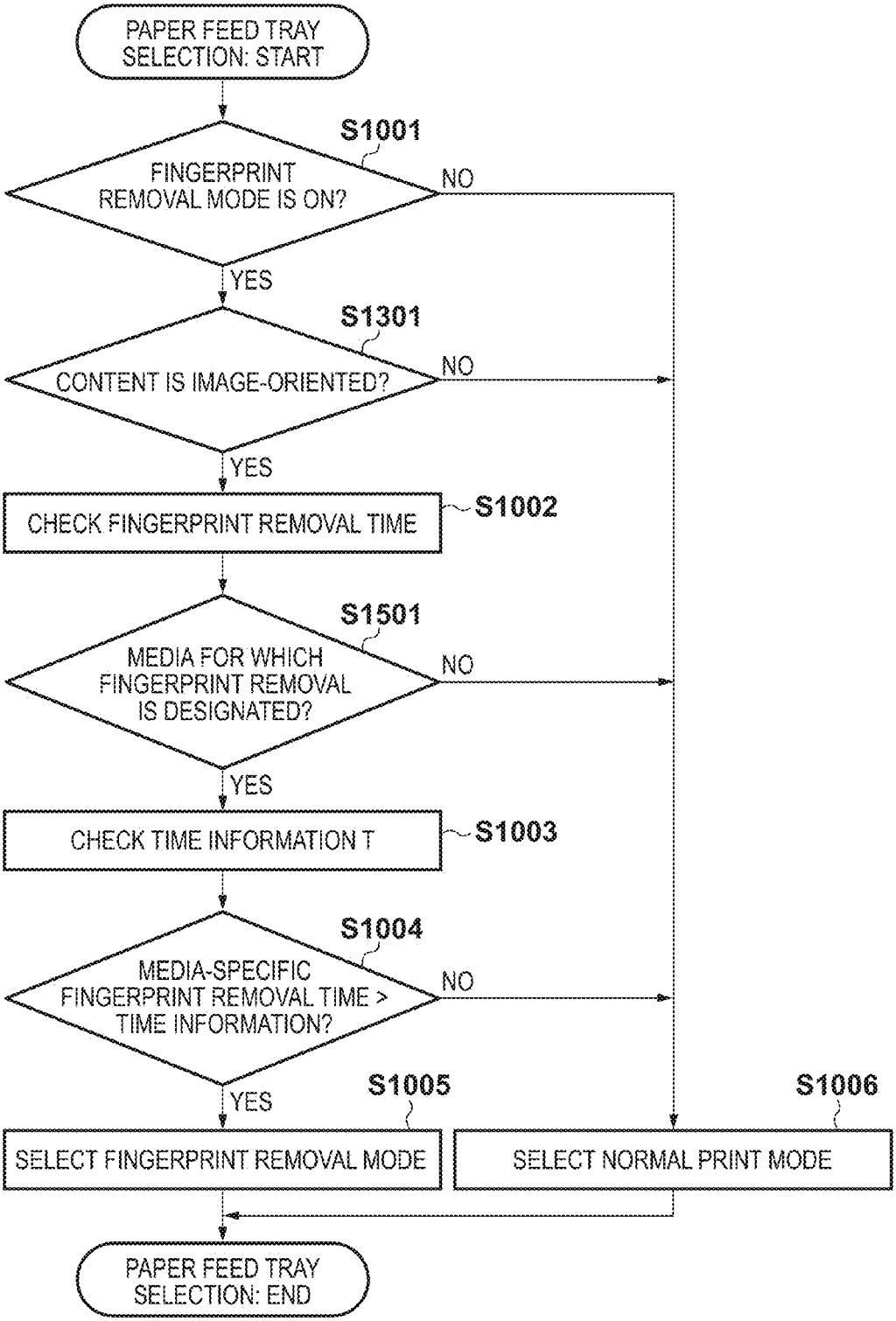
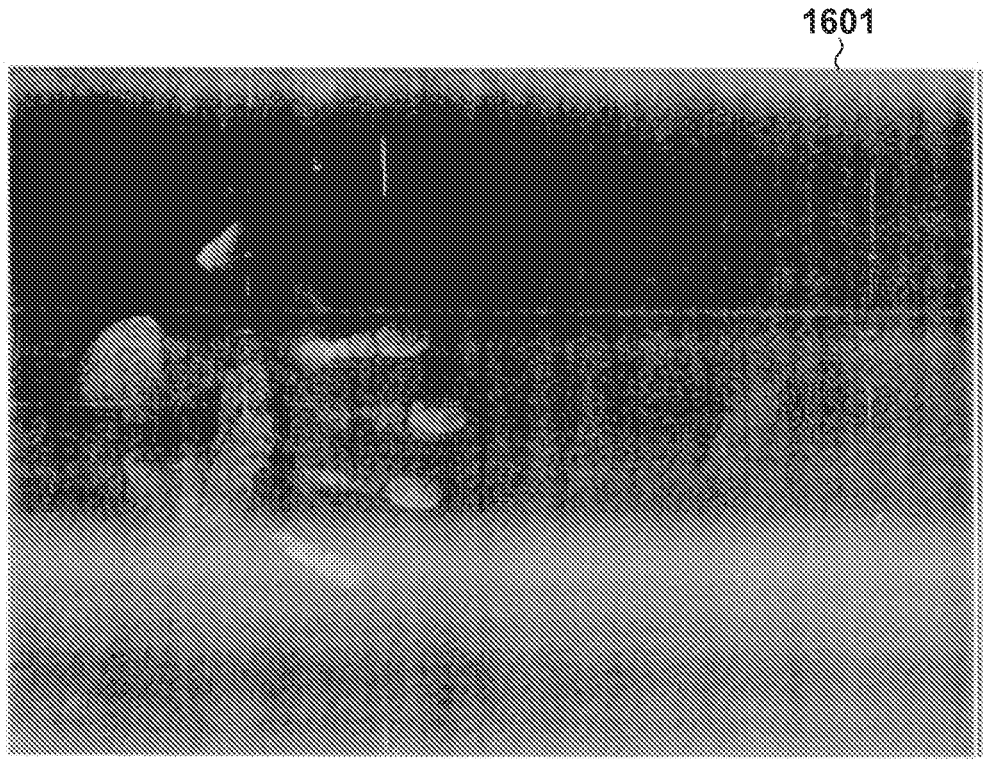

1400
PAPER FEED TRAY SETTINGS: SHEET TYPE SELECTION
SHEET TYPE-SPECIFIC SETTINGS
NAME
FINGERPRINT REMOVAL MODE
NORMAL PAPER
ON
RECYCLED PAPER
1401
OFF
COLOR PAPER
ON
COATED PAPER
ON
HEAVY PAPER
ON
LABEL PAPER
ON
BACK
OK

FIG. 15


PAPER FEED TRAY SELECTION: START
S1001
FINGERPRINT REMOVAL MODE IS ON?
NO
YES
S1301
CONTENT IS IMAGE-ORIENTED?
NO
YES
CHECK FINGERPRINT REMOVAL TIME
S1002
S1501
MEDIA FOR WHICH FINGERPRINT REMOVAL IS DESIGNATED?
NO
YES
CHECK TIME INFORMATION T
S1003
S1004
MEDIA-SPECIFIC FINGERPRINT REMOVAL TIME > TIME INFORMATION?
NO
YES
S1005
S1006
SELECT FINGERPRINT REMOVAL MODE
SELECT NORMAL PRINT MODE
PAPER FEED TRAY SELECTION: END

PRIOR ART

FIG. 16



PRINTING APPARATUS AND CONTROLLING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a printing apparatus that performs processing for removing fingerprints left on a printing medium, and a method of controlling the same.

2. Description of the Related Art

Grease and moisture from the human body causes a reduction in resistivity in portions of a sheet that come into contact with a fixer, and there are cases where, for example, they cause a transfer failure when toner is transferred to the sheet, thus resulting in fingerprint marks being left on the printing result as shown by reference sign **1601** in FIG. **16**. In order to address such a defect in a fixed image, there is known to be an image forming apparatus that has a fingerprint removal mode function for removing fingerprint marks by causing a sheet with fingerprints on it to pass through the fixer one time before printing in order to remove the oil component of the fingerprints on the sheet (Japanese Patent Laid-Open No. 2007-286108). Japanese Patent Laid-Open No. 2007-286108 discloses that the image forming apparatus removes smudging such as a fingerprint mark by executing pre-fixing on sheets fed to the manual paper feed tray. Japanese Patent Laid-Open No. 2007-286108 further discloses that a user can enable/disable the fingerprint removal function using an operation unit.

In Japanese Patent Laid-Open No. 2007-286108, the fingerprint removal mode is set using the operation unit of the image forming apparatus when printing sheets have been fed to the manual paper feed tray. For this reason, when the fingerprint removal mode is set, printing is performed in the fingerprint removal mode until all of the sheets set in the manual paper feed tray are gone. Since the fingerprint removal mode involves operations in which printed matter is passed through the fixer one time before being printed on and then discharged, the printing speed is slower than that in normal printing.

Fingerprints left on a sheet actually gradually disappear as time passes. Although it depends on the type and thickness of the printing sheet, fingerprints on ordinary copy sheets disappear in approximately 30 minutes. Accordingly, there are cases where fingerprint removal does not need to be performed for printing sheets for which a long time has passed since being stored in the paper feed tray. Performing fingerprint removal in such case results in an unnecessary increase in the printing time.

SUMMARY OF THE INVENTION

An aspect of the present invention is to eliminate the above-mentioned problems with the conventional technology. The present invention provides a printing apparatus that shortens the printing time when employing the fingerprint removal mode, and a method of controlling the same.

The present invention in its first aspect provides a printing apparatus comprising: a printing unit configured to transfer an image to a sheet conveyed from a sheet storage unit and fix the transferred image to the sheet using a fixing unit; and a control unit configured to, if the elapsed time since the sheet was stored in the sheet storage unit is less than or equal to a threshold value, perform control such that the sheet is heated by the fixing unit before the image is transferred to the sheet, and if the elapsed time since the sheet was stored in the sheet storage unit exceeds the threshold value, perform control such that processing for heating the sheet with the fixing unit before the image is transferred to the sheet is not performed.

The present invention enables shortening the printing time when employing the fingerprint removal mode.

Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a diagram showing a configuration of an image forming system.

FIG. **2** is a diagram showing a print driver setting screen.

FIG. **3** is a diagram showing an operation unit of an image forming apparatus.

FIG. **4** is a diagram showing an operation screen displayed on the operation unit.

FIG. **5** is a diagram showing a configuration of the periphery of a fixing unit of the image forming apparatus.

FIG. **6** is a diagram showing a paper feed tray selection screen displayed on the operation unit.

FIG. **7** is a diagram showing a sheet media setting screen displayed on the operation unit.

FIG. **8** is a diagram showing a sheet type database saved in the image forming apparatus.

FIG. **9** is a flowchart showing a procedure of paper feed tray setting processing performed by the image forming apparatus according to an embodiment.

FIG. **10** is a flowchart showing a procedure of print mode selection processing according to Embodiment 1.

FIG. **11** is a diagram showing the sheet type database saved in the image forming apparatus.

FIG. **12** is a flowchart showing a procedure of printing operation determination processing in a fingerprint removal mode.

FIG. **13** is a flowchart showing a procedure of print mode selection processing according to Embodiment 2.

FIG. **14** is a diagram showing a sheet media setting screen displayed on the operation unit.

FIG. **15** is a flowchart showing a procedure of print mode selection processing according to Embodiment 3.

FIG. **16** is a diagram showing fingerprint marks left on printing matter.

DESCRIPTION OF THE EMBODIMENTS

Preferred embodiments of the present invention will now be described hereinafter in detail, with reference to the accompanying drawings. It is to be understood that the following embodiments are not intended to limit the claims of the present invention, and that not all of the combinations of the aspects that are described according to the following embodiments are necessarily required with respect to the means to solve the problems according to the present invention. Note that like constituent elements will be denoted by like reference signs, and redundant descriptions thereof will not be given.

Embodiment 1

Configuration of Image Forming System

FIG. **1** is a diagram showing a configuration of an image forming system according to the present invention. In this image forming system, client PCs **101** to **103** and an image forming apparatus **104** are communicably connected to each other via a network **100**. The client PCs **101** to **103** are general PCs (information processing apparatuses), for example. The image forming apparatus **104** is a printing apparatus that prints images and characters onto printing media (referred to

hereinafter as "sheets") based on a received print job, for example. The client PCs **101** to **103** can receive, from the image forming apparatus **104**, various types of information such as print errors and statuses that indicate the apparatus status of the image forming apparatus **104**.

The client PCs **101** to **103** all have the same configuration. Although the following description is given for the client PC **101**, it similarly applies to the client PCs **102** and **103** as well. As modules, the client PC **101** implements a print driver **108** and a status display unit **107** that displays the status of the image forming apparatus **104**. Although the status display unit **107** is implemented so as to be included in the print driver **108** in the following description, it may be implemented separately from the print driver **108** as shown in FIG. **1**.

FIG. **2** is a diagram showing an example of a setting screen of the print driver **108** on the client PC **101**. Print drivers **108** that respectively correspond to the image forming apparatuses **104** that perform printing are implemented in the client PC **101** in advance, and the user selects the print driver **108** for the desired image forming apparatus **104**, and inputs a print job. The print driver **108** can receive a designation of multiple output destinations **201** from the user. The multiple output destinations **201** referred to here are a printer, a user box, and secure printing. In the case of outputting printing matter from the image forming apparatus **104**, the user designates "printer" as the output destination **201**. Also, in the case of saving print job data in the image forming apparatus **104**, the user designates "user box" as the output destination **201**. The print driver **108** can switch the print job processing in the image forming apparatus **104** according to the output destination **201** designated by the user.

The status display unit **107** displays a status indicating the apparatus status of the image forming apparatus **104** on a screen of the client PC **101** so as to notify the user. Here, the status display unit **107** displays statuses of the image forming apparatus **104** such as "idling", "printing", and "toner shortage", as well as printer error statuses such as "no paper" and "paper jam". The status display unit **107** can acquire the status of a registered image forming apparatus **104** at any time by requesting the status from that image forming apparatus **104** at a constant time interval. Also, the status display unit **107** periodically updates the display of the status of the image forming apparatus **104** based on the results of the status request. The user can therefore determine whether or not a print job can be input based on the up-to-date display of the status of the image forming apparatus **104**.

Block Configuration of Image Forming Apparatus

A printing apparatus is described as an example of the image forming apparatus in the present embodiment. The image forming apparatus **104** may be, for example, an apparatus that has functions other than printing, such as a multifunction device in which multiple functions such as copy and scanning are integrated. A printing apparatus that has at least a printing configuration and a configuration for receiving user operations is used as the image forming apparatus **104** of the present embodiment. The image forming apparatus **104** receives a print job input by the client PC **101**, and executes printing based on the print job. As shown in FIG. **1**, the image forming apparatus **104** includes multiple function blocks, namely a control unit **112**, a job interpretation unit **109**, an image forming unit **113**, an image saving unit **111**, a fixing unit **114**, an operation unit **110**, and a paper discharge unit **115**. Note that among the various configurations of an ordinary image forming apparatus, FIG. **1** shows only portions related to operations that realize the present embodiment.

Control Unit **112**

The control unit **112** includes a CPU, a ROM, a RAM, and an HDD. The control unit **112** starts an operating system (OS) with a boot program stored in the ROM, and executes various types of processing by executing application programs saved in the HDD on the OS. The control unit **112** controls various units, and performs print processing while cooperating with other units based on a print job saved in the image saving unit **111**. Information regarding a sheet size, a sheet type, a paper feed tray (sheet storage unit), and a paper discharge tray is described in a print job, and the control unit **112** executes the print job based on such information. The control unit **112** also saves PDL code described in the print job to the image saving unit **111**.

Job Interpretation Unit **109**

A print job is described in a printer language called PDL code. Print jobs input from the client PC **101** via the network **100** are interpreted by the job interpretation unit **109** in the order of input. The job interpretation unit **109** interprets information such as a sheet size, a sheet type, a paper feed tray, and a paper discharge tray, and saves the interpreted information in the image saving unit **111** in association with the print job. A flag indicating whether the data to be output is character data or image data is also set in the print job. Although this will be described later, the job interpretation unit **109** reads this flag and selects the print mode in which print processing is to be executed.

Image Forming Unit **113**

The image forming unit **113** generates image data based on the PDL code of an input print job. Processing for generating image data from PDL code is generally called rasterizing (or RIP). As described above, a flag indicating whether the data to be output is character data or image data is set in the print job. The image forming unit **113** performs edge filter processing on character data so that character edges have a good appearance. The image forming unit **113** performs smoothing filter processing on image data so as to obtain a smooth image compared to peripheral pixels.

Image Saving Unit **111**

The image saving unit **111** is configured by a memory, an HDD, or the like, and temporarily saves rasterized image data generated by the image forming unit **113** until processing is performed by the fixing unit **114**. The image saving unit **111** also saves interpretation results of the job interpretation unit **109** in association with rasterized image data in units of jobs. Also, the image saving unit **111** saves print jobs input from the client PC **101** as PDL code as well. The image saving unit **111** further saves a paper feed tray database **800** shown in FIG. **8** and a sheet type database **1100** shown in FIG. **11**, which will be described later.

Operation Unit **110**

FIG. **3** is a diagram showing an example of the operation unit **110** of the image forming apparatus **104**. The operation unit **110** is configured by a touch panel on a liquid crystal display (LCD), for example. When buttons **301** displayed on an operation screen being displayed are pressed by the user, information corresponding to the pressed buttons is transmitted to the control unit **112**. In addition to the LCD, a start key, a stop key, a numerical keypad, and the like are configured as hard keys **302** of the operation unit **110**.

FIG. **4** is a diagram showing an example of the operation screen displayed on the operation unit **110**. Buttons allowing the user to select various types of functions are displayed as touch keys in the bottom portion of the operation screen. Examples of the displayed buttons include a schedule tab **404** for managing a schedule of print jobs input to the image forming apparatus **104**, and a jobs tab **405** for managing and displaying information regarding various types of jobs such

as print jobs and copy jobs. Other displayed buttons include a trays tab **406** for displaying paper feed tray statuses and for performing the setting of, for example, the type of printing medium (e.g., printing sheet), and a system tab **407** for performing system management of the image forming apparatus **104**.

Fixing Unit **114**

FIG. **5** is a diagram showing a configuration of the periphery of the fixing unit **114** of the image forming apparatus **104**. The fixing unit **114** fixes a print image to a sheet based on rasterized image data saved in the image saving unit **111**. A laser driver **501** of the fixing unit **114** drives a laser emitting unit **502** based on image data input from the control unit **112**. Accordingly, a laser beam modulated according to the image data is emitted from the laser emitting unit **502**. The laser beam is emitted onto a photosensitive drum **503** while being scanned. An electrostatic latent image is formed on the photosensitive drum **503** by the emitted laser beam, and the electrostatic latent image is visualized as a toner image using toner supplied from a developer. In synchronization with the laser beam emission timing, a sheet from one of the paper feed trays is supplied between the photosensitive drum **503** and a transfer unit **504** via a conveyance path, and the toner image on the photosensitive drum **503** is transferred onto the fed sheet by the transfer unit **504**.

In the present embodiment, sheets are supplied from a manual paper feed portion and three levels of POD decks included in a high capacity sheet feeding deck **513**, via a conveyance path **509** to the right of the photosensitive drum. Note that the manual paper feed portion is mounted in place of the high capacity sheet feeding deck **513** when the high capacity sheet feeding deck **513** has been detached. Also, sheets are supplied from a built-in cassette via a conveyance path **510** below the photosensitive drum. A sheet with a toner image transferred thereon is conveyed to a pair of fixing rollers **505** by the driving of a conveyance belt. The pair of fixing rollers is configured as a pair made up of a heating roller and a pressing roller. The pair of fixing rollers **505** heats and presses the printing medium, thus fixing the toner image on to the sheet. After passing through the pair of fixing rollers **505**, the sheet is discharged to a paper discharge accessory by a pair of paper discharge rollers **506**. The paper discharge accessory is an apparatus that executes post-processing (also called "finishing") such as sorting and stapling.

Here, in the case where the image forming apparatus **104** operates in a later-described fingerprint removal mode, fingerprints are removed by applying heat with the fixing unit **114** to a supplied sheet one time before printing (pre-print processing), and then the sheet subjected to fixing is turned back by a flapper **507** and guided to a paper re-feed conveyance path **508**. On the other hand, in the case where double-sided printing in particular has been designated in a normal print mode, the sheet is guided by the flapper **507** to an inverting path **511**. The sheet conveyed along the inverting path **511** is then guided by the flapper **512** to the paper re-feed conveyance path **508**. The printing medium guided to the paper re-feed conveyance path **508** is then re-supplied between the photosensitive drum **503** and the transfer unit **504** at predetermined timing, and a toner image is transferred onto the underside of the sheet.

In this way, in the present embodiment, the conveyance path in the case of the fingerprint removal mode and the conveyance path in the case of the double-sided printing are switched by an instruction from the control unit **112**.

Paper Discharge Unit **115**

The paper discharge unit **115** discharges sheets subjected to fixing by the fixing unit **114** in the order set in the print job. The image forming apparatus **104** can apply various paper discharge accessories according to the finishing mode set in the print job. Also, the control unit **112** can reference various types of information on paper discharge accessories saved in the image forming apparatus **104**, determine the paper discharge functions that can be performed, and display those finishing modes on the operation unit **110**.

When a print job is input from the client PC **101**, the job interpretation unit **109** references information on the various paper feed trays. The control unit **112** references the information on the various paper feed trays from the paper feed tray database **800** saved in the image saving unit **111**. The control unit **112** can switch the fingerprint removal mode and the normal print mode according to the information on the various paper feed trays. This will be described in detail later.

Job Management Screen

In the case of performing job management, the user presses the jobs tab **405** in the bottom portion of the operation screen. FIG. **4** shows the operation screen displayed at that time. Based on print jobs input from the client PC **101**, the operation unit **110** displays the print jobs as a job list **403** arranged in order from the top in the central portion of the operation screen in FIG. **4**. New jobs are added to the bottom of the job list **403**. The job title, the number of pages, the number of sets, the job input time, the elapsed time, media (sheet) information, and the like are displayed as items **408** in the job list **403**.

The current status of the image forming apparatus **104** is displayed as an item **401** in the top portion of the operation screen in FIG. **4**. In FIG. **4**, "Stopped" is displayed as the status. In the present embodiment, the operation screen in FIG. **4** is displayed at the stage immediately before printing is temporarily stopped and a paper feed tray is assigned to the print job. The type of sheet to be used in the print job, the grammage, the size, and the like are displayed as media information on the right side in the job list **403**. A newly input print job is displayed in the job list **403** along with the attached sheet information.

As previously described, the print driver **108** of the client PC **101** receives, from the image forming apparatus **104**, printing errors and various types of information on paper feeding, paper discharge accessories, and the like. Information in the sheet type database **1100** (described later) in FIG. **11** that is saved in the image saving unit **111** is also received by the print driver **108** from the image forming apparatus **104**. Based on such information, the print driver **108** displays up-to-date information regarding the up-to-date correspondence between paper feed trays and sheets in the image forming apparatus **104**. The print driver **108** attaches media information selected by the user to a print job, and transmits the print job to the image forming apparatus **104**. In the case where sheets corresponding to the sheet type attached to the print job are associated with a paper feed tray at the time of printing based on the print job, the control unit **112** performs printing on such sheets. On the other hand, in the case where sheets corresponding to the sheet type attached to the print job are not associated with a paper feed tray, the control unit **112** temporarily stops printing. At that time, the user associates a type of printing medium and a paper feed tray in order to perform printing. When the user then presses the portion of the media information **408** on the right side in the job list **403** on the operation screen in FIG. **4**, the operation unit **110** displays a paper feed tray selection screen **500** for associating a sheet type and a paper feed tray with each other.

Paper Feed Tray Setting

FIG. **6** is a diagram showing an example of a paper feed tray setting screen **600** displayed on the operation unit **110** of the image forming apparatus **104**. The setting screen **600** is dis-

played if the user presses the trays tab **406** on the operation screen in FIG. **4**. Paper feed accessory information **602** regarding paper feed accessories configured in the image forming apparatus **104** is displayed on the paper feed tray setting screen **600**. The paper feed accessory information **602** is displayed in correspondence with the positions where the actual paper feed accessories are configured.

In the case where the user is to add or newly replenish sheets in a paper feed tray, the user selects a paper feed tray button **601** on the setting screen **600** by pressing it, and then presses an assign button **603**. The paper feed tray button **601** and the accessories arranged in the image forming apparatus **104** are coordinated, and the control unit **112** opens the cassette of the paper feed accessory at the same position as the button pressed by the user. The user then adds or newly replenishes sheets to be used for printing in the open paper feed tray, and then closes the cassette. When the control unit **112** detects that the paper feed tray cassette was closed using a sensor or the like, the control unit **112** displays a sheet media setting screen on the operation unit **110**.

FIG. **7** is a diagram showing an example of the sheet media setting screen displayed on the operation unit **110** of the image forming apparatus **104**. A sheet media setting screen **700** is a screen for setting the type and weight of the sheet set in the paper feed tray by the user. Pre-provided items **701** such as normal paper, recycled paper, and color paper can be assigned to the paper feed tray by the user. Also, regarding the sheet size displayed on the setting screen **700**, the control unit **112** can detect the sheet size based on the position of a guide placed against the side of the sheets in the paper feed tray. The operation unit **110** displays a fingerprint removal mode ON/OFF button **702** on the sheet media setting screen **700**. By setting to the button **702** to "ON", the user can cause the image forming apparatus **104** to operate in the fingerprint removal mode when printing is to be performed on the sheets supplied from that paper feed tray. If the button **702** is set to "ON" by the user, a fingerprint removal mode item **801** for the paper feed tray in the paper feed tray database **800** saved in the image saving unit **111** is set to "ON" by the control unit **112**.

FIG. **9** is a flowchart showing a procedure of paper feed tray setting processing performed by the image forming apparatus **104** according to the present embodiment. The processing steps shown in FIG. **9** are executed by, for example, the CPU of the image forming apparatus **104** controlling various units of the image forming apparatus **104** shown in FIG. **1**. The execution of this flowchart is started if the paper feed tray setting screen **600** is opened, or the trays tab **406** is pressed by the user.

If the user presses a paper feed tray button **601** and then presses an OK button **604**, the control unit **112** opens the paper feed tray that corresponds to the paper feed tray button that was pressed (step S**901**). A sensor is disposed in each paper feed tray, and the control unit **112** can recognize that the paper feed trays have been opened or closed (one example of detection in replenishing). In order to store information indicating that the paper feed tray was opened, the control unit **112** sets a paper feed tray open item **806** in the paper feed tray database **800** to "Open". When the paper feed tray is opened, that is to say, when sheet replenishing is performed, the control unit **112** detects the remaining sheet amount in the paper feed tray (step S**902**). For each paper feed tray other than the manual paper feed tray, the control unit **112** can detect the remaining sheet amount as a percentage based on the percentage of 100% for the full state (one example of remaining amount detection). In particular, for a paper feed tray in which sheets are loaded with the printing surface face-down, the control unit **112** can, based on the remaining sheet amounts when the user opened the paper feed tray and when the user closed the paper feed tray, approximately specify how many sheets down from the top a sheet likely to have fingerprints left thereon is in the current sheet bundle.

All of the items in the paper feed tray database **800** stored in the image saving unit **111** are updated each time the information on the paper feed trays changes, such as when printing is performed and when sheets are replaced in the paper feed trays. Accordingly, up-to-date information regarding the paper feed trays is always saved in the paper feed tray database **800**. First, based on the items **802** in the paper feed tray database **800**, the control unit **112** acquires the remaining sheet amount for the paper feed tray to which the user desires to input sheets. Then, when the user closes the paper feed tray, the control unit **112** again detects the remaining sheet amount, and determines an increase/decrease in the remaining sheet amount (step S**903**). Here, if it is determined that the remaining sheet amount increased, the control unit **112** saves the added sheet amount in an item **803** in the paper feed tray database **800**. The control unit **112** also saves the time when the user closed the paper feed tray in an item **804** in the paper feed tray database **800** (step S**904**). The control unit **112** furthermore measures the elapsed time from that time, and saves the measured elapsed time in the item **804** as well. When the user presses the OK button **604** in the paper feed tray setting screen **600** or the trays tab screen, the processing of FIG. **9** ends (step S**905**).

Paper Feed Tray Selection, Mode Check

FIG. **10** is a flowchart showing a procedure of print mode selection processing performed by the image forming apparatus **104** according to the present embodiment. This procedure is executed by, for example, the CPU of the image forming apparatus **104** controlling various units of the image forming apparatus **104** shown in FIG. **1**. As previously described, when printing is to be performed by the image forming apparatus **104**, if the type of sheet (sheet type) to be used does not exist in a paper feed tray, the user associates a paper feed tray and a sheet type as shown in FIGS. **6** and **7**. The processing of this flowchart is executed before printing if the sheet type designated in the print job exists in a paper feed tray. On the other hand, if the sheet type does not exist in a paper feed tray, this processing is executed when the user presses a media information button **402** in the job list **403**.

If the user presses the media information button **402** in the job list **403**, the control unit **112** displays the paper feed tray setting screen **600**. When the media information button **402** is pressed by the user, information on the sheets in the paper feed trays connected to the image forming apparatus **104** is displayed on the paper feed tray setting screen **600** along with images of the paper feed trays, based on the paper feed tray database **800**. If the user selects a paper feed tray button **601** on the paper feed tray setting screen **600** and then presses the OK button **604**, the control unit **112** associates that paper feed tray with the print job that is the current processing target. At this time, the control unit **112** can also select multiple paper feed trays and assign them to the print job.

The control unit **112** determines whether or not the fingerprint removal mode item **801** in the paper feed tray database **800** saved in the image saving unit **111** is "ON" for the paper feed tray to be used in the print job (step S**1001**). If it is determined that the fingerprint removal mode item in the paper feed tray database **800** is "ON", the control unit **112** acquires the sheet type set in the paper feed tray selected by the user from among the sheet type items in the paper feed tray database **800**.

Next, the control unit **112** searches for media information set for the paper feed tray in a table indicated as the sheet type

database **1100** in FIG. **11**, which is saved in the image saving unit **111** (step S**1002**). Sheet types **1101** for the sheet media and fingerprint removal times **1102**, which are threshold values for determining whether fingerprint removal is to be performed, are associated with each other in the sheet type database **1100**. Based on the paper feed tray database **800**, the control unit **112** detects the elapsed time **804** since sheets were replenished in the paper feed tray (step S**1003**).

Based on the paper feed tray database **800**, the control unit **112** compares the fingerprint removal time **1102** that corresponds to the sheet media set in the print job with the elapsed time since sheets were replenished, which is saved as the item **804** in the paper feed tray database **800** (step S**1004**). Here, if a certain time has not elapsed, that is to say, if the elapsed time is less than or equal to the threshold value, the control unit **112** selects the fingerprint removal mode as the print mode (step S**1005**). On the other hand, if a certain time has elapsed, it is determined that the fingerprints have disappeared, and the control unit **112** selects the normal print mode as the print mode (step S**1006**).

In the present embodiment, if a sheet shortage occurs during printing, and furthermore there is a paper feed tray having the same type of sheets as the type of sheets being used in printing, the control unit **112** switches to the paper feed tray having the same sheets set therein. In this case as well, the control unit **112** selects the print mode based on the flowchart in FIG. **10**.

Printing Operations in Fingerprint Removal Mode

As was described with reference to FIG. **5**, depending on the paper feed tray, a sheet passing along the paper feed conveyance path in the image forming apparatus **104** is vertically inverted and then conveyed to the fixer. In the present embodiment, the image forming apparatus **104** saves model (mechanism) information in correspondence with each paper feed tray as an item **805** in the paper feed tray database **800**. Note that the built-in cassette **1** is associated with the paper feed cassette in FIG. **5**, and the POD decks **1** to **3** are associated with the three levels of POD decks in the high capacity sheet feeding deck **513**. Although not shown in FIG. **5**, a built-in cassette **2** is a paper feed cassette that can be optionally attached to the image forming apparatus **104**.

If the user touches a sheet bundle, fingerprints will be left on the upper surface of the sheet at the top of the sheet bundle and on the lower surface of the sheet at the bottom of the bundle. In the case of the conveyance path from the manual paper feed tray (first sheet storage unit) connected so as to supply sheets to the conveyance path **509** ("manual model"), sheets are not vertically inverted during conveyance in the image forming apparatus **104**, and therefore the upper surface of the sheet at the top of the sheet bundle with fingerprints thereon comes into contact with the photosensitive drum **503** as the printing surface. Accordingly, if the selected paper feed tray is "manual model", printing is performed in the fingerprint removal mode when printing on the first printing medium sheet. Printing is then performed in the normal print mode from the second sheet onward.

On the other hand, in the case of the conveyance path from the built-in cassette (second sheet storage unit) connected so as to feed sheets to the conveyance path **510** ("inversion cassette"), the sheet is vertically inverted during conveyance before coming into contact with the photosensitive drum **503**. Accordingly, printing is performed in the normal print mode when printing on the first printing medium sheet. Also, since the lower surface of the sheet at the bottom of the added sheet bundle is inverted, the lower surface with fingerprints thereon comes into contact with the photosensitive drum **503** as the printing surface. Accordingly, the control unit **112** calculates, as an approximate calculation, the number of printed sheets until the surface with fingerprints thereon will come into contact with the photosensitive drum, based on the added sheet amount indicated by the item **803** in the paper feed tray database **800**. This can be calculated based on, for example, the number of pages that can be printed in the case where the paper feed tray is full of sheets, and the current remaining sheet amount (%). In the vicinity of the surface with fingerprints thereon (e.g., at the 5th to 10th page from that surface), the control unit **112** performs printing in the fingerprint removal mode. In this way, the image forming apparatus **104** switches the print mode according to the paper feed tray.

FIG. **12** is a flowchart showing a procedure of printing operation determination processing (printing control method) in the fingerprint removal mode. This procedure is executed by, for example, the CPU of the image forming apparatus **104** controlling various units of the image forming apparatus **104** shown in FIG. **1**. When the operation unit **110** displays the operation screen shown in FIG. **4**, the control unit **112** starts the execution of this flowchart. The control unit **112** detects the model information of the paper feed trays based on the items **805** in the paper feed tray database **800** (step S**1201**). The control unit **112** determines whether or not the sheets in the paper feed trays will be vertically inverted in the conveyance paths based on the paper feed tray model information (step S**1202**). If it is determined that the printing medium in the conveyance path will not be vertically inverted in the conveyance path, the control unit **112** prints only the first sheet in the fingerprint removal mode (step S**1203**). This corresponds to the case where, for example, sheets are fed from the paper feed tray connected so as to feed sheets to the conveyance path **509** in FIG. **5**. On the other hand, if it is determined that vertical inversion will occur, the control unit **112** performs printing in the fingerprint removal mode for the sheets in the vicinity of the added sheet amount (step S**1204**). This corresponds to the case where, for example, sheets are fed from the paper feed tray connected so as to feed sheets to the conveyance path **510** in FIG. **5**.

Embodiment 2

FIG. **13** is a flowchart showing a procedure of print mode selection processing performed by the image forming apparatus **104** according to the present embodiment. The present embodiment differs from Embodiment 1 with respect to the processing of step S**1301** in FIG. **13**.

In the present embodiment, the job interpretation unit **109** interprets the PDL code of a print job input from the client PC **101**, and determines based on the interpretation result whether the print output information is character information or image information (one example of job determination). The result of this determination is used when the image forming unit **113** executes image forming processing. For example, if it is determined that the print output information is character information, filter processing is performed such that the character edges have a good appearance (edge processing). Also, if it is determined that the print output information is image information, filter processing is performed such that the image is smoother compared to peripheral pixels (smoothing processing).

Step S**1301** in FIG. **13** is executed after it is determined in step S**1001** that the fingerprint removal mode item **801** in the paper feed tray database **800** is "ON". When printing is to be performed, the image forming apparatus **104** then moves to step S**1002** in order to change the print mode on a page-by-page basis based on the result of interpreting the PDL code in the print job input from the client PC **101**. If the interpretation result indicates that the print output information is character information, the control unit **112** moves to step S**1006** in order

to select the normal print mode. On the other hand, if the interpretation result indicates that the print output information is image information, the control unit **112** selects the fingerprint removal mode. In the present embodiment, printing is performed in the fingerprint removal mode since the presence of fingerprints will be visually noticeable if the printing matter is an image (steps **S1003**-**S1005**). Also, if the printing matter is characters, printing is performed in the normal print mode since the presence of fingerprints will not be visually noticeable. As a result, efficiency can be improved by shortening the time required for print processing. Note that if it is determined in step **S1301** that the print output information includes a combination of image information and character information, the procedure moves to step **S1002** in order to select the fingerprint removal mode.

Embodiment 3

FIG. **15** is a flowchart showing a procedure of print mode selection processing performed by the image forming apparatus **104** according to the present embodiment. The present embodiment differs from Embodiment 2 with respect to the processing of step **S1501** in FIG. **15**.

In the present embodiment, the image saving unit **111** manages sheet types **1101** for the sheet media and the fingerprint removal times **1102** in the sheet type database **1100**. Sheet types such as "normal paper" and "recycled paper" are set as the sheet types **1101** associated in the sheet type database **1100**.

FIG. **14** is a diagram showing an example of a sheet media setting screen displayed on the operation unit **110** of the image forming apparatus **104**. The setting screen in FIG. **14** is displayed when a sheet-specific detailed setting button **703** displayed on the sheet media setting screen **700** in FIG. **7** is pressed. The setting screen **1400** in FIG. **14** is displayed in the case where whether or not the fingerprint removal mode is to be implemented is to be set for each sheet type. By pressing fingerprint removal mode ON/OFF buttons **1401** displayed on the setting screen **1400**, the user can set whether or not printing is to be performed in the fingerprint removal mode for each sheet type. If the user sets a fingerprint removal mode ON/OFF button **702** displayed on the sheet media setting screen **700** to "ON", that button is displayed in a grayed-out manner.

In the present embodiment, the image forming apparatus **104** can switch the print mode between the fingerprint removal mode and the normal print mode using the initial setting for each sheet type when performing printing. For example, a use mode is possible in which the fingerprint removal mode is not used in the case of performing printing with paper for which pre-printing is to be performed, such as recycled paper. In step **S1501**, the control unit **112** detects the sheet type of the printing medium set in the paper feed tray, and then moves to step **S1003** in order to switch the print mode to the fingerprint removal mode depending on the sheet type.

Other Embodiments

Aspects of the present invention can also be realized by a computer of a system or apparatus (or devices such as a CPU or MPU) that reads out and executes a program recorded on a memory device to perform the functions of the above-described embodiments, and by a method, the steps of which are performed by a computer of a system or apparatus by, for example, reading out and executing a program recorded on a memory device to perform the functions of the above-described embodiments. For this purpose, the program is provided to the computer for example via a network or from a recording medium of various types serving as the memory device (e.g., computer-readable medium).

While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

This application claims the benefit of Japanese Patent Application Nos. 2012-172301, filed Aug. 2, 2012, and 2012-172300, filed Aug. 2, 2012, which are hereby incorporated by reference herein in their entirety.

What is claimed is:

1. A printing apparatus comprising:

a printing unit configured to transfer an image to a sheet conveyed from a sheet storage unit and fix the transferred image to the sheet using a fixing unit;

a timer unit configured to measure an elapsed time since the sheet is set in the sheet storage unit;

a memory unit configured to store a threshold value associated with the elapsed time; and

a control unit configured to determine, based on the measured elapsed time measured by the timer unit, whether or not to perform control such that the sheet is heated by the fixing unit before the image is transferred to the sheet,

wherein the control is determined to be performed in a case where the measured elapsed time is less than or equal to the stored threshold value, and the control is determined not to be performed in a case where the measured elapsed time exceeds the stored threshold value.

2. The printing apparatus according to claim **1**, wherein the memory unit is configured to store a plurality of threshold values in association with types of sheets, and the control unit is configured to select one of the stored plurality of threshold values in accordance with a type of the sheet set in the sheet storage unit.

3. The printing apparatus according to claim **2**, wherein the control unit selects the threshold value to be a first value in a case where the type of the sheet set in the sheet storage unit is a first type, and selects the threshold value to be a second value in a case where the type of the sheet set in the sheet storage unit is a second type different from the first type.

4. The printing apparatus according to claim **1**, wherein in a case where the measured elapsed time is less than or equal to the stored threshold value, the control unit performs control such that the sheet is heated with the fixing unit before the image is transferred to the sheet, the sheet is then conveyed via a double-sided conveyance path, and then the image is transferred to the conveyed sheet.

5. The printing apparatus according to claim **1**, further comprising:

a determination unit configured to determine whether an image is to be printed on the sheet based on image data or an image is to be printed on the sheet based on character data,

wherein in a case where the measured elapsed time is less than or equal to the stored threshold value and the determination unit determines that an image is to be printed on the sheet based on the image data, the control unit performs control such that the sheet is heated by the fixing unit before the image is transferred to the sheet, and

in a case where the measured elapsed time is less than or equal to the stored threshold value and the determination unit determines an image is to be printed on the sheet based on the character data, the control unit performs

control such that processing for heating the sheet with the fixing unit before the image is transferred to the sheet is not performed.

6. A method of controlling a printing apparatus, the method comprising:

a printing step of transferring an image to a sheet conveyed from a sheet storage unit and fixing the transferred image to the sheet using a fixing unit;

a measuring step of measuring an elapsed time since the sheet is set in the sheet storage unit; and

a control step of determining, based on the measured elapsed time measured in the measuring step, whether or not to perform control such that the sheet is heated by the fixing unit before the image is transferred to the sheet,

wherein the control is determined to be performed in a case where the measured elapsed time is less than or equal to a threshold value associated with the elapsed time, stored in a memory unit, and the control is determined not to be performed in a case where the measured elapsed time exceeds the threshold value.

7. A non-transitory computer readable storage medium storing a program for causing a computer to execute the method for controlling a printing apparatus, the method comprising:

a printing step of transferring an image to a sheet conveyed from a sheet storage unit and fixing the transferred image to the sheet using a fixing unit;

a measuring step of measuring an elapsed time since the sheet is set in the sheet storage unit; and

a control step of determining, based on the measured elapsed time measured in the measuring step, whether or not to perform control such that the sheet is heated by the fixing unit before the image is transferred to the sheet,

wherein the control is determined to be performed in a case where the measured elapsed time is less than or equal to a threshold value associated with the elapsed time, stored in a memory unit, and the control is determined not to be performed in a case where the measured elapsed time exceeds the threshold value.

8. The printing apparatus according to claim **1**, wherein heating by the fixing unit before the image is transferred to the sheet is performed for removing a fingerprint mark.

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